

ROBINSICHTHYS ARROWSMITHENSIS, A NEW GENUS AND SPECIES OF DEEP-DWELLING GOBIID FISH FROM THE WESTERN CARIBBEAN

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Abstract.—*Robinsichthys arrowsmithensis* is described from Arrowsmith Bank in the western Caribbean. The genus is among the deepest dwelling gobiids with some specimens taken below 240 m. The diagnostic characters and monophyly of the tribe Gobiosomini are discussed. *Robinsichthys* is assigned to the Gobiosomini; however, its relationship to other gobiosominines is unclear.

The difficulty and expense of collecting on deep, rough-bottom habitats makes their faunas among the most poorly known in the sea. In 1967–1968, the University of Miami research vessels R/V *John Elliott Pillsbury* and R/V *Gerda* made two brief collecting forays, comprising five 3 m otter-trawl stations, in depths ranging from about 90 to 585 m on Arrowsmith Bank. The bank, a submarine prominence northeast of the island of Cozumel off the coast of Yucatan, is centered at approximately 21°05'N, 86°30'W. Along its western margin, the bank drops precipitously from depths of approximately 20 m to over 4000 m in the adjacent Yucatan Channel. The waters are of tropical oceanic clarity and it is apparent that the live-bottom habitat extends to a considerable, but undetermined, depth. The limited material obtained includes an unusually large proportion of undescribed or poorly known species of fishes, crustaceans, and mollusks. Among the fishes collected was the gobiid, *Robinsichthys arrowsmithensis*, herein described as new.

Methods and materials.—Counts and measurements were made following Böhlke & Robins (1968) except as noted. Measurements are straight-line distances made with an ocular micrometer and converted to the nearest 0.1 millimeter. Morphometric data are presented in thousandths of standard length (SL). Gill-raker counts are from the

first ceratobranchial plus first epibranchial. Vertebral counts, spinous dorsal-fin pterygiophore formulae (DF), and number of anal pterygiophores preceding the first haemal spine (AP) were determined from radiographs or cleared and stained material and follow the conventions and notational procedures of Birdsong et al. (1988). Institutional abbreviations used are: UMML, University of Miami, Rosenstiel School of Marine and Atmospheric Sciences; USNM, National Museum of Natural History, Washington, D.C.

Robinsichthys, new genus

Diagnosis.—Vertebrae $11 + 17 = 28$; 7 spinous dorsal-fin pterygiophores, the last with or without a spine; cephalic lateralis pores absent; pelvic fins separate to base, rays branched with fifth ray longest; caudal fin with hypurals 1–2 fused to each other but free from hypurals 3–4 and the terminal vertebral element; one epural; body scaled posterior to pectoral axil with 25–28 caducous scales; caudal fin with at least one highly modified scale (Fig. 1) on base of upper primary rays, lower base probably also with a modified scale but none remain in the specimens; two anal pterygiophores preceding first haemal spine (vertebra 12); epipleural ribs present on vertebrae 1–9, pleural ribs on vertebrae 3–10; metapterygoid

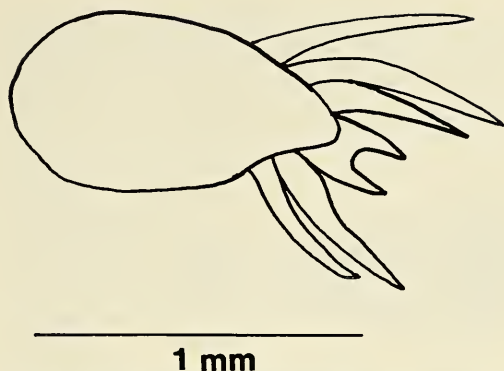


Fig. 1. Modified basicaudal scale of *Robinsichthys arrowsmithensis*; ctenii oriented posteriad.

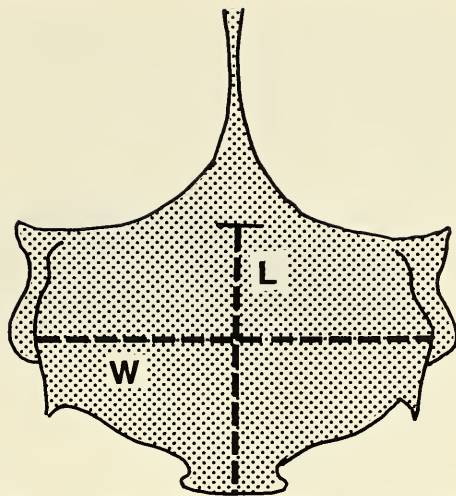


Fig. 2. Diagrammatic dorsal view of the brain case of *Robinsichthys arrowsmithensis* illustrating the measurements used in calculating the length/width ratio; anterior toward the top.

separated from quadrate by cartilage, not anteriorly expanded; ossified basihyal spatulate with anterolateral cartilagenous extensions making tongue emarginate; all vertebrae with reduced neural arches that lack lateral foramina; brain case broad, length/width approximately 0.7 (Fig. 2); frontals very narrow between orbits; both nostrils opening at the ends of short tubes; upper lip with free dorsal margin. The genus is further characterized by those features given below for *R. arrowsmithensis*, the single included species and type by monotypy and original designation.

Etymology.—In recognition of his many contributions to our knowledge of American gobies, the generic name is derived from the surname of C. Richard Robins and *ichthys*. The gender is masculine.

Robinsichthys arrowsmithensis,
new species

Figs. 1–3, Tables 1–3

Holotype.—USNM 290207, male (21.8 mm SL), 21°02'N, 86°26'W, R/V *Gerda* sta 952, beginning depth 586 m, ending depth 92 m, 28 Jan 1968.

Paratypes.—USNM 290208, male (22.4 mm SL) and female (20.4 mm SL), same data as holotype; UMML 34393, female (23.2 mm SL), 20°59'N, 86°24'W, R/V *Gerda* sta 897, beginning depth 293 m, ending

depth 210 m, 10 Sep 1967; UMML 34392, two females (23.5 mm SL, cleared and stained, and 15.2 mm SL), 21°10'N, 86°21'W, R/V *Gerda* sta 893, beginning depth 242 m, ending depth 320 m.

Description.—In addition to those characteristics given for the genus, the species is characterized by: 6 or 7 spines in the D_1 and spinous dorsal-fin pterygiophore formula of 3-22111*0 (holotype and one paratype), 3-221110 (two paratypes), and 3-22111*00 (one paratype); $D_2 = I, 10$ (I,9 in one specimen); $A = I, 10$ (I,9 in one specimen); $P_1 = 21$ –24 (usually 22–23); P_2 rays with moderately enlarged tips in holotype but not apparent in other specimens; caudal fin with 31–33 total rays, 9/8 or 8/8 segmented rays, 7/7, 8/7, or 8/8 procurent rays; gill rakers 9 + 1; gill opening extending from upper pectoral base ventrally to point below posterior preopercular margin; teeth caninoid, in two rows in both jaws; lower jaw with outer row comprising 4–7 slightly enlarged, anteriorly placed teeth, inner row comprising about 40 smaller teeth; upper jaw with outer row comprising about 20



Fig. 3. Holotype of *Robinsichthys arrowsmithensis*, USNM 290207, male, 21.8 mm SL.

slightly enlarged, widely spaced teeth, inner row of about 60 smaller teeth; sensory papillae pattern too damaged to be described.

Individual morphometric data given in Table 2. Average values in thousandths of SL are: head length 333; snout length 70; eye diameter 106; interorbital distance 15; upper jaw length 138; P_1 length 244; P_2 length 190; caudal-fin length 234; longest D_1 spine (the second) 185; greatest body depth 176.

The following description of the pigmentation pattern of alcohol preserved specimens is based on photographs of the holotype (Fig. 3) and two paratypes taken a few months after capture. The material is now faded such that little of the pattern remains. Ground color pale with the pattern formed by concentrations of large discrete melanophores in varying densities. Body and caudal-fin base marked by four vertical,

dusky bars; anterior bar the most prominent and extends dorsad from the belly to the D_1 and well onto dorsal spines 4–6 or 7; second bar extends from the anal-fin origin onto the anterior rays of the D_2 fin; third bar, the least conspicuous of the four, extends from the area just above the anal-fin terminus onto the posterior rays of the D_2 fin; posteriormost bar lies on the caudal-fin base, with some melanophores extending anteriorly along the midline. On the dorsum, between the vertical bars, lie a series of dusky blotches or saddles that extend onto the dorsal fins. These saddles located as follows: one at the D_1 terminus, one at the middle of D_2 base, and two (the two coalesced in the holotype) on the dorsal surface of the caudal peduncle. Venter along anal-fin base bears scattered melanophores.

Ventral rays of caudal fin dusky, espe-

Table 1.—Frequency distribution of meristic features in *Robinsichthys arrowsmithensis*.

| Count | Lateral scale pockets | | | | D_2 elements | | Anal elements | | P_1 elements (left and right) | | | |
|---------------------|-----------------------|----|----|----|----------------|----|---------------|----|------------------------------------|----|----|----|
| | 25 | 26 | 27 | 28 | 9 | 10 | 9 | 10 | 21 | 22 | 23 | 24 |
| Number of specimens | 2 | 1 | 1 | 1* | 1 | 5* | 1 | 5* | 2 | 4* | 5* | 1 |

* Condition in holotype.

Table 2.—Morphometrics of *Robinsichthys arrowsmithensis*. Standard lengths expressed in mm, other measurements in thousandths of standard length.

| | USNM 290207* | USNM 290208 | USNM 290208 | UMML 34393 | UMML 34392 | UMML 34392 |
|------------------------------|-----------------|----------------|----------------|---------------|---------------|---------------|
| Sex | M | M | F | F | F | F |
| Standard length (mm) | 21.8 | 22.4 | 20.4 | 23.2 | 15.2 | 23.5 |
| Head length | 316 | 321 | 320 | 333 | 370 | 340 |
| Snout length | 63 | 62 | 72 | 79 | 73 | — |
| Eye diameter | 105 | 107 | 99 | 107 | 103 | 115 |
| Interorbital distance | 12 | 16 | 14 | 16 | 18 | — |
| Upper jaw length | 139 | 132 | 131 | 147 | 158 | 123 |
| P ₁ length | 270 | 226 | — | — | 242 | 238 |
| P ₂ length | 186 | 173 | 158 | 187 | 224 | 209 |
| Caudal-fin length | 234 | — | — | — | — | — |
| Longest D ₁ spine | 186 | 210 | 171 | 187 | 170 | — |
| Greatest body depth | 177 | 181 | 180 | 171 | 170 | — |

* Holotype.

cially near their tips, and dorsal half of caudal fin bears two dark slashes. Anal fin dusky along the distal margin and pelvic fins uniformly dusky.

Head has triangular dusky blotch below the eye (the apex pointing ventrad) and scattered melanophores along the margin of the upper lip. Operculum bears large, widely spaced melanophores that extend ventrad onto the branchiostegal membranes, dorsad across the nape, and posteroventrad to the pectoral axil.

Etymology.—The specific epithet, *arrowsmithensis*, is taken from the name of the type locality in the western Caribbean, Arrowsmith Bank.

Discussion.—The affinities of *Robinsichthys*, though enigmatic, clearly lie with the American seven-spined gobies. Birdsong (1975) proposed the Tribe Gobiosomini to encompass the American seven-spined gobies and several apparently allied genera also endemic to the New World, to wit, *Aruma*, *Barbulifer*, *Bollmannia*, *Chiolepis*, *Eleotrica*, *Enypnias*, *Evermannichthys*, *Ginsburgellus*, *Gobiosoma* (including *Elacatinus* of some authors), *Gobulus*, *Gymneleotris*, *Microgobius*, *Nes*, *Palatogobius*, *Pariah*, *Parrella*, *Psilotris*, *Pycnomma*, *Risor*, and *Var-*

icus. The primary characters used to unite these endemic American genera were a DF of 3-221110 (in all but *Evermannichthys*, *Pariah*, and *Risor*), an uncommon vertebral count of 11+16–17 (in all but *Evermannichthys* and *Pariah*), and the fusion of hypurals 1–2 with hypurals 3–4 and the terminal vertebral element (in all but *Bollmannia*, *Microgobius*, *Palatogobius*, and *Parrella*). Subsequently, Hoese (1976) allied the monotypic Chilean genus *Ophiogobius* on the basis of overall similarity. *Ophiogobius* has the typical hypural fusion of the group but is divergent in DF (3-221110 or 3-212110) and in vertebral number (13+18–19).

Birdsong et al. (1988) inferred that the Gobiosomini, as originally conceived, was not monophyletic. However, a subset, referred to by them simply as the “Gobiosoma Group,” and including *Ophiogobius* but excluding *Bollmannia*, *Microgobius*, *Palatogobius*, and *Parrella* was hypothesized as monophyletic based on the unusual hypural fusion. Among gobiids (sensu Hoese 1984) a similar hypural fusion is known to occur only in the Indo-Pacific six-spined genera *Eviota*, *Gobiodon*, *Gobiopterus*, *Kelloggella*, *Monishia*, and *Trimmatom*, all

Table 3.—Comparison of *Robinsichthys* with phenetically similar genera.

| Character | <i>Robinsichthys</i> | <i>Chriolepis</i> | <i>Varicus</i> | <i>Pycnomma</i> | <i>Parrella</i> | <i>Palatogobius</i> | <i>Microgobius</i> |
|----------------------------|----------------------|-------------------|----------------|-----------------|-----------------|---------------------|--------------------|
| D ₂ | 9–10 | 10–12 | 9–12 | 10–11 | 11–12 | 19–20 | 14–21 |
| Anal fin | 9–10 | 10–11 | 8–11 | 9–10 | 12–13 | 20 | 14–22 |
| Vertebrae | 11+17 | 11+16 | 11+16 | 11+16 | 11+16 | 11+16 | 11+16 |
| AP | 2 | 2* | 1* | 2 | 2 | 2 | 2 |
| Hypural fusion | absent | present | present | present | absent | absent | absent |
| Neural arches | reduced | normal | normal | normal | normal | normal | normal |
| Vomerine teeth | absent | absent | absent | absent | absent | present | absent |
| Cephalic LL pores | absent | absent | absent | present | present | present | present |
| Pelvic fins | separate | separate | separate | separate | united | united | united |
| Modified basicaudal scales | present | present | present | present | absent | absent | absent |

* Condition of the type species.

probably unrelated to the Gobiosomini. The four excluded genera were sequestered as the “Microgobius Group” and were only phenetically associated on the basis of DF and vertebral osteology.

Despite the comments of Birdsong et al. (1988), and at the risk of appearing to argue with myself, I remain convinced of the validity of the Gobiosomini, including the “Microgobius Group” and *Robinsichthys*, even though it is supported by the single synapomorphy, DF = 3-221110, a character in which *Robinsichthys* shows some variation and four genera (*Evermannichthys*, *Ophiogobius*, *Pariah*, and *Risor*) display divergent autapomorphous conditions probably derived from 3-221110. This pterygiophore pattern is known outside the group only in the monotypic Philippine genus *Tukugobius*, a genus that appears unrelated on the basis of most other characters.

The preceding resumé has been presented to provide the required background for comments on the relationships of *Robinsichthys*. *Robinsichthys*, like the “Microgobius Group,” lacks the diagnostic hypural fusion found in all other Gobiosomini, but in the possession of modified basicaudal scales it resembles the “Gobiosoma Group” (Table 3). Many species scattered among at least seven genera of the “Gobiosoma Group” have modified basicaudal scales,

whereas none in the “Microgobius Group” do. Additionally, such scales are not present in any other gobioids and I, therefore, consider them to be apomorphic within some subset of the Gobiosomini. The value of the character in establishing relationships within the tribe is diminished, however, by the apparent independent loss of the scales in a number of species and genera.

Excepting the absence of hypural fusion (which may represent a reversal), *Robinsichthys* is most similar overall to the “Gobiosoma Group” genera *Chriolepis*, *Varicus*, and *Pycnomma*. The limits of *Chriolepis* and *Varicus* are poorly defined and, as noted by Birdsong et al. (1988), it is likely that both genera are polyphyletic. *Robinsichthys* shares with *Varicus* and *Chriolepis* the absence of cephalic lateralis pores and canals, and with these two genera plus *Pycnomma*, the loss of a pelvic frenum and the loss or near loss of a membrane uniting the inner pelvic rays, the presence of modified basicaudal scales, and the absence of a quadrate process on the metapterygoid. Also, expanded pelvic-ray tips, present in the holotype of *R. arrowsmithensis*, are known among the Gobiosomini only in *Varicus*. *Robinsichthys*, *Chriolepis*, and *Varicus* are among the deepest dwelling gobies, each having some species recorded below 175 m. The similarities exhibited may represent

convergent adaptations to a deep habitat and, thus, carry no phylogenetic information.

The reduction of the neural arches in *Robinsichthys* appears to be an autapomorphy. Such reductions are common in fishes and have been noted by Pezold (pers. comm.) in several oxudercine and gobionelline genera of gobies, two groups that do not appear to be closely related to the Gobiosomini. A survey of some 75 species representing all other genera of Gobiosomini has failed to find a similar condition in any of them.

In the possession of modified basicaudal scales and the lack of fusion of hypurals 1–2 with 3–4 and the terminal vertebral element, *Robinsichthys* appears to bridge the gap between the “Gobiosoma Group” and the “Microgobius Group” of Birdsong et al. (1988). However, the loss of cephalic lateralis pores, lack of fusion of the pelvic fins, and reduction of the neural arches are all apomorphic states within the Gobiosomini thus rendering *Robinsichthys* an unlikely candidate as the sister group of any large portion of the “Gobiosoma Group.” If the lack of hypural fusion prerepresents a reversal, it seems likely that the closest relatives of *Robinsichthys* will be found among those species presently assigned to *Varicus* or *Chriolepis*.

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